2086

ERRATUM

SPECIFICATION No. 1,176,162

Page 2, *after* "scribed.", line 13, *insert* paragraph

"Each tread moulding segment has a radially outwardly extending lug 16 on its radially outer surface through which is secured the pivot 4. The ends of the pivot are located in the open-sided slots in one of the mounting brackets so as to be rotatable therein and the pivot is contacted with the end 15 of the lever 12 so that the pivot and hence the segment is urged radially outwardly."

THE PATENT OFFICE
9th February 1970

1176162 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

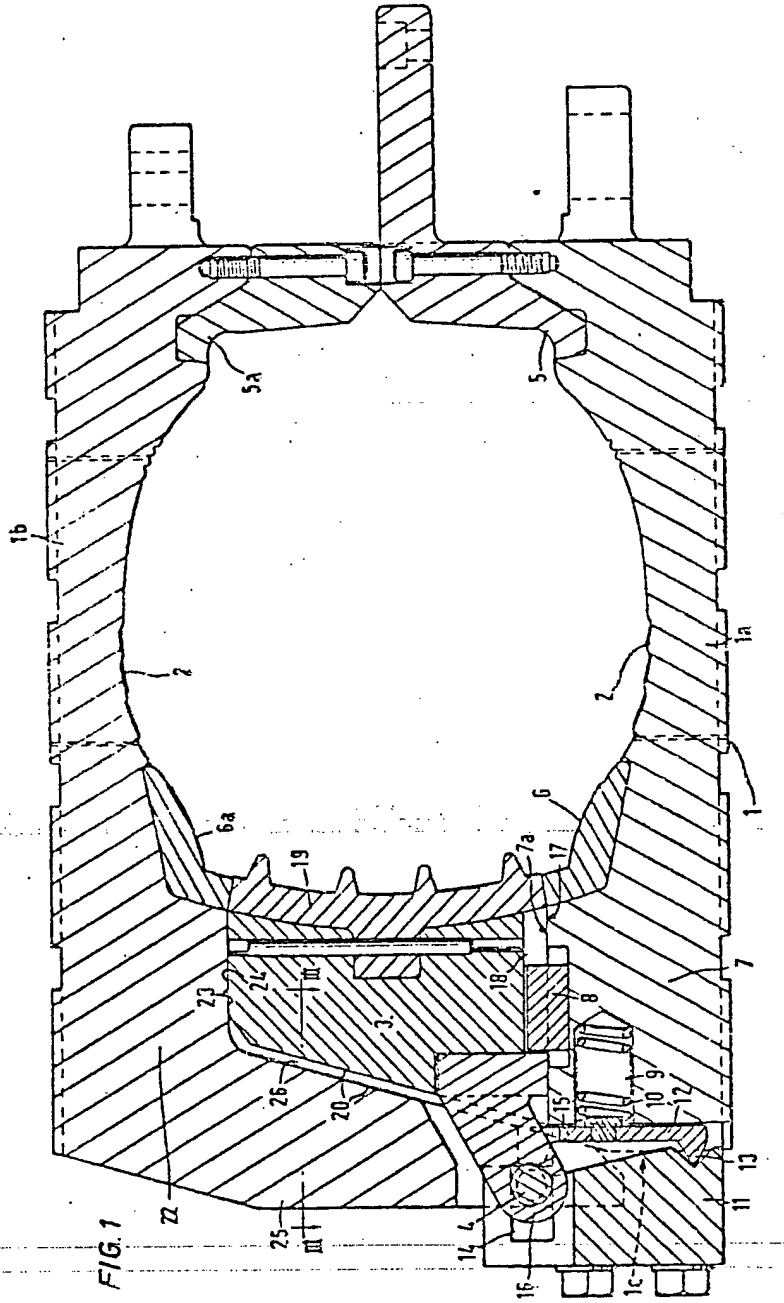


FIG. 1

1176162 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 2

FIG.3

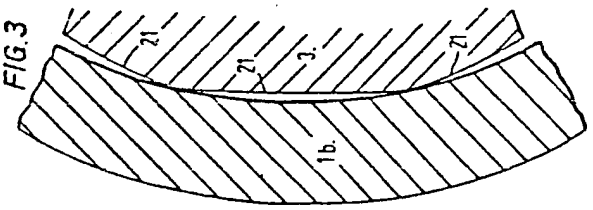
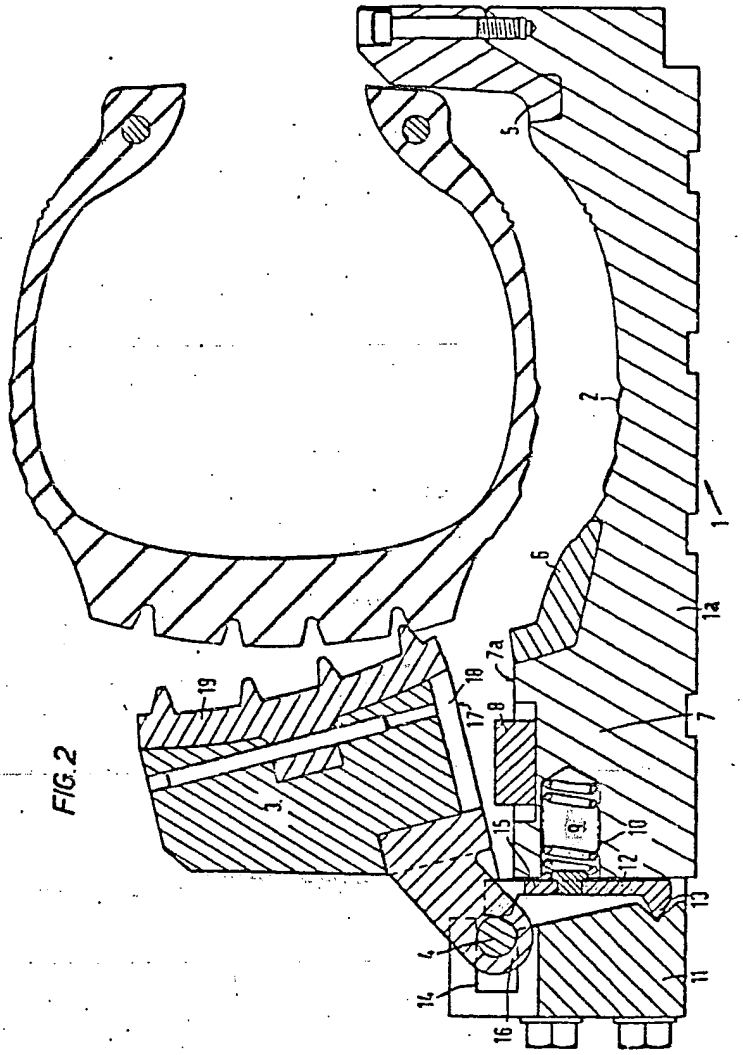


FIG.2



PATENT SPECIFICATION

DRAWINGS ATTACHED

1,176,162

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COMPLETE SPECIFICATION

Improvements in or relating to Moulds for Pneumatic Tyres

We, THE DUNLOP COMPANY LIMITED, (formerly The Dunlop Rubber Company Limited) a British Company of Dunlop House, Ryder Street, St. James's, London S.W.1., (formerly of 1, Albany Street, London N.W.1.), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to moulds for pneumatic tyres.

According to the invention a mould for a pneumatic tyre comprises two halves in co-axial relationship each having a side-wall-mounting portion and a plurality of tread moulding segments located between the moulding portions and disposed relatively to one another circumferentially of the mould in the form of an annulus, each of said segments being pivotally mounted on one of the mould halves. Preferably the tread moulding segments are also slidable radially with respect to the sidewall moulding portions.

Preferably also the tread moulding segments are slidable on a substantially planar supporting surface which extends radially outwardly of said sidewall moulding portion and preferably spring means are provided for urging the segments radially outwardly.

According to a further aspect of the invention the co-operative sliding surfaces of the segments and said mould half have portions of a low coefficient of friction in comparison with the coefficient of friction of the remainder of said surfaces.

According to a still further aspect of the invention the radially outer peripheral surfaces of the tread segments and of one mould half have portions thereof which are formed with a taper and the other mould half has a surface adapted to engage the said tapered portions of both the segments and the first mould half so as to locate said mould halves and tread segments in co-axial relationship.

One embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 illustrates in cross-section part of an annular tyre mould,

Figure 2 illustrates in cross-section the mould of Figure 1 with a moulded tyre, the top half of the mould removed and the tyre partly removed, and

Figure 3 is a cross-sectional view of a tread segment and part of the top mould half along the line 3—3 of Figure 1.

The mould 1 for a pneumatic tyre comprises as shown in Figure 1 a steel lower mould half 1*a* and a steel upper mould half 1*b* in co-axial relationship, each provided with a side-wall moulding portion 2 on the axially inner face thereof and eight tread moulding segments 3 mounted on pivots 4, and radially movable with respect to the lower mould half 1*a*.

The lower mould half has bead moulding portions 5 and shoulder moulding portions 6 respectively radially inwardly and outwardly of the sidewall moulding portions. An integral annular flange 7 extends radially outwardly from the shoulder moulding portions and has on its axially inner face a substantially planar supporting surface 7*a* on which the tread segments are slidable as will be described later. Eight guide members 8 one for each segment are secured to the supporting surface. On the radially outer periphery of the flange of the lower mould half are spaced, equiangularly, eight recesses 9 in each of which is located a compression spring 10; eight mounting brackets 11 are bolted to the flange one over each of the recesses. A segment-moving lever 12 is located within the bracket and has one end 13 pivotally mounted on the bracket and

[*Price 5s. 0d.*]

is urged radially outwardly by the spring 10. At the axially inner end of each bracket is provided a pair of open-sided slots 14, said open sides facing radially inwardly of the mould. The other end 15 of the segment-moving lever is located adjacent said open sides and radially inwardly thereof and is urged radially outwardly towards the slots 14 by the spring 10. Between the brackets the radially outer peripheral surface of the lower mould half tapers radially inwardly (at 1*c*) as it extends axially inwardly for a purpose to be described.

Each tread segment has an axially outer face 17 in contact with the supporting surface 7*a* of the lower mould half and is slidable on this supporting surface. The face 17 of each tread segment is provided with a generally radial slot 18 in which a guide member 8 secured to the supporting surface is a sliding fit. Also on the face 17 of each tread segment is provided two recesses in which are located blocks of "Fluorosint" (Registered Trade Mark) (not illustrated) which stand slightly proud of said face. "Fluorosint" is a material manufactured by Polypenco Limited having a low coefficient friction in contact with steel and is compressible as compared with steel.

The radially inner surfaces of the tread mould segments have secured thereto, by dowel pins, portions 19 of the tread matrix which imparts to the moulded tyre the desired tread patterh. Those portions of the radially outer surfaces of the segments at which the pivot lugs are not affixed are formed with an axially tapering surface 20 which is an extension to the taper on the radially outer surface of the lower mould half. The radially outer surfaces of the tread segments each comprises three facets 21 (See Figure 3) which intersect each other in edges which are for engagement with the upper mould half 1*b* as will be described.

The upper half 1*b* of the mould has bead moulding portions 5*a* and shoulder moulding portions 6*a* and an integral annular flange 22 extending radially outwardly from the shoulder moulding portion. The axially inner face 23 of this flange has a substantially radial planar surface extending from said shoulder moulding portion which is adapted to contact with the axial faces 24 of the tread segments remote from the lower mould half. Radially outwardly of this planar face the flange has a substantially wedge-shaped portion 25 which extends towards the lower mould half and which is of a length to extend into contact with the lower mould half when the mould is in a closed condition. This wedge-shaped portion has radially inner surface 26 which is of frusto-conical form and has a taper to correspond complementarily with the tapered surfaces 20 of the facets 21 formed on the tread segments and lower mould half and to contact said surfaces when the mould is in a closed condition.

In the use of the mould 1, when the mould is in an open condition, the tread segments 3 are urged radially outwardly of the lower half 1*a* by the compression springs 10 and the segment-moving levers 12 and the supporting surface 7*a* of the lower mould half is in contact with the "Fluorosint" blocks which stand proud of aforesaid faces of the segments.

An unvulcanised tyre is located in the mould with one bead portion in contact with the bead forming portion 5 of the lower mould half, the upper mould half is moved co-axially towards the lower mould half to engage the other bead portion of the tyre in contact with the bead forming portion 5*a* of the upper mould half. Further movement of the upper mould half towards the lower mould half brings the frusto-conical surface 26 of the wedge-shaped portion 25 into contact with the tapered surfaces 20 of the tread segments at the two edges formed by the intersection of the facets 21, and urges the segments radially inwardly, the conical surface sliding freely over the edges on the outer surfaces of the tread segments, and the tread segments sliding freely over the supporting surface of the lower mould half, by reason of the low coefficient of friction of the "Fluorosint" blocks, against the pressure of the compression springs. The guide members 8 secured to the supporting surface and the engagement of the two lines of intersection of the facets with the frusto-conical surface of the lower mould half constrain the movement of the segments in a generally radial direction and avoid jamming of the segments. The exact circumferential location of the segments to form the tread matrix is obtained by the abutment of the radially extending faces of the segments as they move inwardly against the springs to form a complete annular tread ring of segments.

During the last part of the movement of the upper mould half before the mould becomes completely closed the "Fluorosint" blocks are compressed under the closing load flush with the face 17 of the segment so that a substantial part of the majority of the clamping load is taken by the radially extending faces 17 of the segments. When the mould is completely closed the lower part of the frusto-conical surface 26 is in contact with the tapered surfaces 1*c* of the lower mould half and this interaction locates the upper mould accurately with respect to the lower mould half.

After vulcanisation of the tyre in the closed mould the mould is opened by removal axially of the upper mould half. The tread segments 3 adhere firmly to the vulcanised tyre, the compression spring 10 not being sufficiently strong to break this adhesion.

An extractor ring is inserted in the tyre and the tyre pulled upwards by the extractor ring to break adhesion between the lower mould half 1*a* and the sidewall of the tyre. During this removal of the tyre the tread segments

3 pivot about the axes of the pivots 4 and peel away from the tread. When the tyre has been removed the compression springs are sufficiently strong to urge the segments radially outwardly to allow unobstructed insertion of a fresh unvulcanised tyre.

WHAT WE CLAIM IS:—

1. A mould for a pneumatic tyre comprising two moulded halves in co-axial relationship each having a sidewall-moulding portion and a plurality of tread moulding segments located between the moulding portions and disposed relatively to one another circumferentially of the mould in the form of an annulus, each of said segments being pivotally mounted on one of the mould halves.

2. A mould as claimed in claim 1 in which the segments are slidable radially with respect to the sidewall moulding portions.

3. A mould as claimed in claim 2 wherein a planar surface is provided on a sidewall moulding portion upon which the segments are slidable.

4. A mould according to claim 3 wherein spring means are provided for urging the segments radially outwardly.

5. A mould according to claim 4 wherein the spring means bears upon a lever or levers engageable with a segment or segments or a member or members attached to the segment or segments.

6. A mould according to claim 5 wherein the segment member or members is or each is a pivot enabling hinging movement of the segment or segments.

7. A mould according to claim 6 wherein the pivot or each pivot is slidable and rotatable in a slot formed in a bracket attached to a mould half.

8. A mould according to claim 2 wherein each tread segment is provided with a block or blocks of material having a low coefficient of friction in contact with steel upon which the segments are slidable.

9. A mould according to claim 8 wherein the block or each block is made of "Fluorosint".

10. A mould according to claim 8 or 9 wherein the block or each block stands proud of a segment surface and is compressible flush with the said surface when a closing load is applied to the mould so that a substantial part of the load is taken by the said surface.

11. A mould according to any of the previous claims wherein the segments and a mould half are provided with co-operating means for guiding the sliding movement of the segments radially.

12. A mould according to claim 11 wherein a mould half is provided with guide members and each segment is provided with a co-operating slot for the reception of a guide member to effect radial guidance.

13. A mould according to any of the preceding claims wherein the outer peripheral surfaces of the tread segments are provided with a taper, a co-operating surface of a mould half being provided with a taper so that when the tapered surfaces engage, the segments are movable radially inwardly into a complete closed annulus.

14. A mould according to claim 13 wherein the said outer peripheral surface of the segments is provided with facets which meet at edges slidable on the said taper of the mould half which is of frusto-conical form.

15. A mould for a pneumatic tyre constructed and arranged substantially as described herein and shown in the accompanying drawings.

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